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# NOTEWORTHY COLLECTION

## CALIFORNIA

AGARDHIELLA SUBULATA (C. Agardh) Kraft & M.J.Wynne (SOLIERIACEAE).—Alameda Co., attached to rocks, Lake Merritt, Oakland, 37.80332, –122.26088, sterile, 10 Aug 2012, *R. L. Moe s.n.* (UC 2050478, UC 2050479); Marina Village Yacht Harbor, Alameda, 37.78483, –122.269120, sterile, 17 Sep 2010, *K. Lesyna s.n.* (UC 1983203).

*Previous knowledge. Agardhiella subulata* is a marine red alga with subdichotomous branching and slender axes that bear irregular numbers of awl-shaped laterals (Kraft and Wynne 1979). It is native to the Atlantic coast of North America (type locality "*In mari Canadensi*") (Agardh 1822). It has been reported worldwide (Guiry and Guiry 2018), but most of these reports were presented without genetic confirmation. Reports of *A. subulata* introductions include Thau Lagoon, France (Verlaque 2001), Italy (Curiel et al. 2005; Sfriso and La Rocca 2005; Manghisi et al. 2010), and the Netherlands (Stegenga 1999).

*Significance*. This is the first report of this species in the eastern Pacific Ocean. This species was collected from Marina Village Yacht Harbor, Alameda, CA, in 2010 and Lake Merritt, Oakland, CA, in 2012. The identification was confirmed by analyzing 1294 base pairs (bp) of *rbc*L DNA sequence data from one specimen of *A. subulata* from Alameda and two specimens from Lake Merritt (GenBank accessions MH179248, MH179249, MH179250) following the DNA extraction protocol of Lindstrom et al. (2011) and PCR methods of Hughey and Hommersand (2008). The three identical sequences differed by 3 bp from a 1404 bp sequence of *A. subulata* from North Carolina, USA (Freshwater et al. 1994; GenBank accession U04176), and by 3 bp from a 470 bp sequence of *A. subulata* isolated from introduced material that was maintained in indoor tank cultures at two fisheries institutions in Okinawa and Kagoshima Prefectures from Japan (Vo et al. 2014; GenBank accession U04176). The DNA sequences of the North Carolina and Japanese specimens were identical, and there are no other sequences in GenBank. Because the DNA sequences of the Alameda and Lake Merritt specimens do not match either of these, we cannot determine the origin of the California introduction. We know neither how long this species has been in California nor do we know its current distribution, since it strongly resembles (and can be easily confused with) the common and presumed native species, *Sarcodiotheca gaudichaudii* (Montagne) P. W. Gabrielson. A search for other specimens from San Francisco and Tomales bays was unsuccessful; specimens that were morphologically similar to *A. subulata*, but were identified as *Sarcodiotheca gaudichaudii* (UC 1861453, UC 1965548, UC 2010034, UC 2009418), were confirmed as *S. gaudichaudii* by *rbc*L gene sequences.

COLPOMENIA CLAYTONIEAE S.M. Boo, K.M. Lee, G.Y. Cho & W. Nelson (SCYTOSIPHONACEAE).—Monterey Co., attached to sunny side of dock in Monterey Harbor, Monterey, 36.608972, –121.893528, gametophytic thalli with plurangia, 7 Feb 2018, *J. R. Hughey s.n.* (UC 2050588) and 19 Feb 2018, *J. R. Hughey s.n.* (UC 2050589).

*Previous knowledge. Colpomenia claytoniae* is a widely distributed species reported from Korea, Japan, Hong Kong, Australia, New Zealand, South Africa, and the USA (type locality: Sangjokam, Goseong, Korea) (Boo et al. 2011). On the basis of *cox*3 DNA sequences, these authors suspected that some of the populations of *C. claytoniae* may be the result of recent introductions. In California, *C. claytoniae* has been confirmed from only two localities: San Pedro and Corral State Beach Park, Malibu. The thallus of *C. claytoniae* is globular and hollow, irregularly convoluted, thin, and expands up to 30 cm in diameter (Boo et al. 2011). It has been overlooked or previously, and incorrectly, identified as *C. peregrina* Sauvageau in northern California and as *C. sinuosa* (Mertens ex Roth) Derbès & Solier south of Point Conception.

*Significance*. This collection extends the range of *C. claytoniae* approximately 480 km north. The gametophytic thalli from Monterey are typical of this species. When fresh they are thin and grow to approximately 7 cm in height, and up to 25 cm in diameter. The Monterey specimens were attached to the dock in full sunlight, growing adjacent to the invasive brown kelp *Undaria pinnatifida* (Harvey) Suringar, which was first collected in the Monterey Marina in 2001 (Silva et al. 2002). The identification was confirmed by analyzing 548 bp of DNA sequence data of the *cox*3 gene from one of the Monterey specimens of *C. claytoniae* (GenBank accession MG976804) following the DNA extraction techniques of Lindstrom et al. (2011) and PCR methods of Boo et al. (2011). The Monterey specimen was identical to four sequences of *C. claytoniae* from San Pedro, California (GenBank accessions HQ833812, HQ833813), Island Bay, Wellington, New Zealand (GenBank accession HQ833798), and Wilson Bay, Coromandel, New Zealand (GenBank accession HQ833807), but differed by 7 bp from a subtidal specimen of *C. claytoniae* from Santa Catalina Island

(Genbank accession MH350895). The Monterey specimens of *C. claytoniae* most likely represent an introduced population because the DNA sequence is identical to specimens from suspected introduced populations of *C. claytoniae* from New Zealand and San Pedro, CA. The Santa Catalina Island specimen, however, which differs by only 1 bp from a specimen of *C. claytoniae* (Genbank accession HQ833786) collected at the type locality on the same date as the type collection (Sangjokam, Goseong, Korea, 12 January 2005), represents a separate introduction.

Examination of specimen images from the specimen database of the University of California's Herbarium (UC), indicates that the Monterey introduction occurred decades ago. Three specimens that resemble *C. claytoniae* were collected in the 1960's from or adjacent to the Monterey marina are: UC1974045, UC1976390, and UC1974044. It is possible that *C. claytoniae* occurs at other coastal harbors in California. However, because this species was misidentified by earlier workers as a larger form of *C. peregrina*, or a variant of *C. sinuosa*, the distribution and abundance of *C. claytoniae* is underestimated.

*PYROPIA SUBORBICULATA* (Kjellman) J.E. Sutherland, H.G. Choi, M.S. Hwang & W.A. Nelson (BANGIACEAE).—Marin Co., epilithic on large boulders in the upper intertidal, associated with *Pyropia perforata* (J.Agardh) S.C. Lindstrom, Sausalito, 37.856111, –122.478556, thalli sterile and fertile, 26 Dec 2017, *J. R. Hughey s.n.* (UC 2050587) and 16 Feb 2018, *J. R. Hughey and M. K. Hughey s.n.* (UC2050590 and UC2050591).

*Previous knowledge. Pyropia suborbiculata* is native to China, Japan, Korea, Phillipines, and Vietnam (type locality: Goto-retto, Nagasaki Prefecture, Japan) (Broom et al. 2002; Vergés et al. 2013), and has been introduced to Australia, Brazil, Iberia, northeastern and northwestern Atlantic, Mediterranean, Mexico, New Zealand, and the northeastern Pacific (Broom et al. 2002; Aguilar-Rosas and Aguilar-Rosas 2003; Klein et al. 2003; Milstein and De Oliveira 2005; Neefus et al. 2008; Hughey 2011; Vergés et al. 2013). Hughey (2011) was the first to report *P. suborbiculata* (as *Porphyra suborbiculata*) from California, where it was found growing attached to barnacles on pilings in Tomales Bay. *Pyropia suborbiculata* has small (up to 4 cm in diameter) ovate to cordate monostromatic blades that are dark brownish red to pink, or bronze and violet (Broom et al. 2002; Aguilar-Rosas and Aguilar-Rosas 2003; Neefus et al. 2008).

*Significance*. This is the second report of *P. suborbiculata* in California. The structure of gametophytic thalli collected in Sausalito was consistent with previous morpho-anatomical descriptions of this species. Despite the small size of *P. suborbiculata*, its discovery was possible due to the conspicuous dark red blades that were visible from the promenade and distinct from the larger bladed, greenish black native species *P. perforata*, whose individuals were intermixed with *P. suborbiculata* on the same boulders. The identification of *P. suborbiculata* was confirmed with an *rbc*L gene sequence (GenBank accession MG944247) that was identical to three specimens from Japan (Iwate, Kanagawa, Yamaguchi) and one from Tomales Bay, CA. The DNA methods were the same as those noted above for *Agardhiella subulata*. Given that small recreational boats commonly travel from San Francisco to nearby coastal waters of Bodega, Half Moon, and the Monterey Bays (Zabin et al. 2014), we predict that *P. suborbiculata* will spread to these localities.

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